CLAIMS

1. A non-enzymatic, non-fluorescent, chemiluminescent method of detecting the interaction between two binding pair members by:

attaching a fluorophore to one of the two binding partner members;

immobilizing the unlabeled binding pair member to a solid support;

allowing the two binding pair members to bind to each other; and

contacting the binding pair members with a solution comprising a chemical-energy transferring composition under conditions that stimulate the release of light energy from the fluorophore to allow detection of the interaction between the two binding pair members.

2. A method of claim 1 wherein the chemical-energy transferring composition comprises an oxalic type compound.

3. A method of claim 2 wherein the oxalic type compound is selected from: an oxalate ester, an oxalic thioester, an oxalate amide, a phosphate containing oxalic type compound.

4. A method of claim 3, wherein the oxalic type compound contains electronegative substituents.

5. A method of claim 4, wherein the electronegative substituents are halogen atoms.

6. A method of claim 5, wherein the halogen atom is chlorine.

7. A method of claim 3 wherein the fluorophores are selected from one of the following groups: xanthenes, coumarins, benzimides, phenanthridines, acridines, cyanines, bodipy dyes, carbazole dyes, phenoxazine dyes, porphyrins, quinolines, polycyclic aromatic hydrocarbons containing at least three fused rings, and quantum dots.

8. A method of claim 7, wherein the fluorophore comprises a parent heteroaromatic ring system.

9. A method of claim 7, wherein the fluorophore comprises a parent xanthene ring.

10. A method of claim 9, wherein the fluorophore comprises a rhodamine-type parent xanthene ring or a fluorescein-type xanthene ring.

11. A method of claim 7, wherein the fluorophore comprises a cyanine dye.

12. A method of claim 10, wherein the fluorophore comprises a rhodamine dye or a fluorescein dye.

13. A method of claim 1 where the binding pair members are selected from the group consisting of: an antibody and antigen, two complementary nucleic acids, a protein and nucleic acid, a virus and host receptor, and a hormone and its cognate receptor.

14. A method of claim 1 where the solid support is selected from the group consisting of an addressed microarray, a bead, a gel and a transparent surface.

15. A method of sequencing a target nucleic acid by:

i. copying the target nucleic acid using a polymerase and nucleotide triphosphates;

ii. randomly terminating polymerase activity using four polymerase blocking nucleotide inhibitors bearing a fluorophore specific for that inhibitor where the inhibitors are present in concentrations able to yield polymerase products terminated at different lengths;

iii. size fractionating the polymerase products in a gel; and,

iv. contacting the products with a solution comprising an oxalic type compound under conditions that stimulate the release of light energy from the fluorophore to allow detection of the product within the gel to sequence the nucleic acid.

16. A non-enzymatic non-fluorescent chemiluminescent system for detecting the interaction between two binding pair members said system comprising an immobilized binding pair member and a non-immobilized binding pair member labeled with a fluorophore and a solution comprising a chemical energy transferring composition that is photo-reactive with the fluorophore.

17. A system of claim 16 wherein the chemical-energy transferring composition comprises an oxalic type compound.

18. A system of claim 17 wherein the oxalic type compound is selected from: an oxalate ester, an oxalic thioester, an oxalate amide, a phosphate containing oxalic type compound.

19. A system of claim 18, wherein the oxalic type compound contains electronegative substituents.

20. A system of claim 19, wherein the electronegative substituents are halogen atoms.

21. A system of claim 20, wherein the halogen atom is chlorine.

22. A system of claim 18 wherein the fluorophores are selected from one of the following groups: xanthenes, coumarins, benzimides, phenanthridines, acridines, cyanines, bodipy dyes, carbazole dyes, phenoxazine dyes, porphyrins, quinolines, polycyclic aromatic hydrocarbons containing at least three fused rings, and quantum dots.

23. A system of claim 22, wherein the fluorophore comprises a parent heteroaromatic ring system.

24. A system of claim 22, wherein the fluorophore comprises a parent xanthene ring.

25. A system of claim 24, wherein the fluorophore comprises a rhodamine-type parent xanthene ring or a fluorescein-type xanthene ring.

26. A system of claim 22, wherein the fluorophore comprises a cyanine dye.

27. A system of claim 25, wherein the fluorophore comprises a rhodamine dye or a fluorescein dye.

28. A system of claim 16 where the binding pair members are selected from the group consisting of: an antibody and antigen, two complementary nucleic acids, a protein and nucleic acid, a virus and host receptor, and a hormone and its cognate receptor.

29. A system of claim 16 where the solid support is selected from the group consisting of an addressed microarray, a bead, a gel and a transparent surface.

30. A system comprising a nucleic acid labeled with a fluorophore where the nucleic acid is in a gel and where the gel is infused with solution comprising an a chemical energy transferring composition that is photo-reactive with the fluorophore.

31. A system of claim 30 wherein the chemical-energy transferring composition comprises an oxalic type compound.

32. A system of claim 31 wherein the oxalic type compound is selected from: an oxalate ester, an oxalic thioester, an oxalate amide, a phosphate containing oxalic type compound.

33. A system of claim 32, wherein the oxalic type compound contains electronegative substituents.

34. A system of claim 33, wherein the electronegative substituents are halogen atoms.

35. A system of claim 34, wherein the halogen atom is chlorine.

36. A system of claim 32 wherein the fluorophores are selected from one of the following groups: xanthenes, coumarins, benzimides, phenanthridines, acridines, cyanines, bodipy dyes, carbazole dyes, phenoxazine dyes, porphyrins, quinolines, polycyclic aromatic hydrocarbons containing at least three fused rings, and quantum dots.

37. A system of claim 36, wherein the fluorophore comprises a parent heteroaromatic ring system.

38. A system of claim 36, wherein the fluorophore comprises a parent xanthene ring.

39. A system of claim 38, wherein the fluorophore comprises a rhodamine-type parent xanthene ring or a fluorescein-type xanthene ring.

40. A system of claim 36, wherein the fluorophore comprises a cyanine dye.

41. A system of claim 39, wherein the fluorophore comprises a rhodamine dye or a fluorescein dye.

42. A system of claim 30 where the binding pair members are selected from the group consisting of: an antibody and antigen, two complementary nucleic acids, a protein and nucleic acid, a virus and host receptor, and a hormone and its cognate receptor.

43. A system of claim 30 where the solid support is selected from the group consisting of an addressed microarray, a bead, a gel and a transparent surface.

44. A system for detecting a biological composition comprising a biological composition labeled with a fluorophore where the composition is bound to a solid support and where the solid support is contacted with a solution comprising an oxalic type compound and a hydroperoxide.

45. A system of claim 44 wherein the chemical-energy transferring composition comprises an oxalic type compound.

46. A system of claim 45 wherein the oxalic type compound is selected from: an oxalate ester, an oxalic thioester, an oxalate amide, a phosphate containing oxalic type compound.

47. A system of claim 46, wherein the oxalic type compound contains electronegative substituents.

48. A system of claim 47, wherein the electronegative substituents are halogen atoms.

49. A system of claim 48, wherein the halogen atom is chlorine.

50. A system of claim 46 wherein the fluorophores are selected from one of the following groups: xanthenes, coumarins, benzimides, phenanthridines, acridines, cyanines, bodipy dyes, carbazole dyes, phenoxazine dyes, porphyrins, quinolines, polycyclic aromatic hydrocarbons containing at least three fused rings, and quantum dots.

51. A system of claim 50, wherein the fluorophore comprises a parent heteroaromatic ring system.

52. A system of claim 50, wherein the fluorophore comprises a parent xanthene ring.

53. A system of claim 52, wherein the fluorophore comprises a rhodamine-type parent xanthene ring or a fluorescein-type xanthene ring.

54. A system of claim 50, wherein the fluorophore comprises a cyanine dye.

55. A system of claim 53, wherein the fluorophore comprises a rhodamine dye or a fluorescein dye.

56. A system of claim 44 where the binding pair members are selected from the group consisting of: an antibody and antigen, two complementary nucleic acids, a protein and nucleic acid, a virus and host receptor, and a hormone and its cognate receptor.

57. A system of claim 44 where the solid support is selected from the group consisting of an addressed microarray, a bead, a gel and a transparent surface.

58. A chemical energy transferring mixture comprising:

a) an oxalic type compound of the formula $Z(CO)_2Z$

b) a peroxide component

c) a biomolecule

59. The mixture of claim 58, wherein Z contains one of the following atoms: an oxygen, a sulfur, a nitrogen, a phosphorus.

60. The mixture of claim 59, wherein the oxalic type compound contains electronegative substituents.

61. The mixture of claim 60, wherein the electronegative substituents are halogens.

62. The mixture of claim 61, wherein the electronegative substituents are chlorine.

63. The mixture of claim 62, wherein the oxalic type compound is an oxalate ester.

64. The mixture of claim 58, wherein the biomolecule is selected from: a polynucleotide, an oligonucleotide, a peptide, a polypeptide, a polysaccharide.

65. The mixture of claim 58, wherein the peroxide component is hydrogen peroxide.